

CONTINUOUS TUMBLE COATING AND BREADING APPARATUS

The present invention relates to an apparatus for applying a coating, particularly a coating of a granular or pulverulent material, to a food product. More specifically, the present invention relates to an apparatus which combines the advantages of a batch tumble-type coating process with the continuity of a conveyor belt-type process.

BACKGROUND OF THE ART

In the food processing industry, it is in many cases desirable to selectively dispense a breading or other coating material onto a food product in a manner which thoroughly and adequately coats the food products. A large variety of various food products are machine-coated with batter, breading or the like before being fried or cooked and packaged for purchase by a consumer. The coating materials used to coat such food products may be breading comprising dry farinaceous materials which may take many forms, but will normally include grain flour in some form. The breading material may also include seasonings, spices, shortening, etc., to form a coating which adds flavor and texture to the product. Other coating material such as ground cereal, dried vegetables or the like may be used as desired. Most breading materials may be roughly classified by their appearance into one of three classes, including flour breading, free flowing breading, or Japanese-style crumbs. Each of these various breading materials have their own peculiarities which may affect the design of a machine adapted to apply the breading material to food pieces. As an example, flour breading, which consists of finely ground dust-like particles, may have a tendency to pack under pressure, thereby increasing the chance that flow of the breading material within a coating machine will become inhibited due to congestion or packing of the breading material. Additionally, with a flour breading, a problem may exist with adequately distributing the breading material within the breading machine to achieve the desired coating characteristics uniformly for all food products introduced into the machine.

Similarly, the breading classified as free flowing usually comprise reasonably hard and roughly spherical particles ranging in size from dust to about $\frac{3}{32}$ on an inch in diameter and may be crackermeal or the like. A problem may exist with adequately distributing free flowing breading material within the coating machine while preventing leakage of the breading material from the coating machine. The Japanese style crumbs consist of a modified wheat flour with small percentages of yeast, salt, sugar, vegetable oil and other additives. The Japanese style crumbs appear to be dried shredded white bread having particle sizes as large as $\frac{1}{2}$ inch or as little as flour size particles with a distribution of sizes therebetween. The Japanese-style crumbs contain no uniform shape and are very delicate such that the coating machine must be able to properly handle this type of breading material to avoid degradation of the quality and particle sizes thereof.

Regardless of the specific breading selected, it is a primary concern to produce a breaded or coated food product which has an aesthetically pleasing appearance and texture. It is also an ultimate aim in the food processing industry to perform the breading operation as a continuous process, so that it may be a part of the overall continuous process of preparing the foodstuff. This is in spite of the fact that a batch-type of breading operation will generally result in a more aesthetically and gustatorially pleasing product. The

batch-type of operation most commonly used would be a hollow drum or roller device, which would be charged with breading and the food products to be coated. The device would then be closed and rotated, so that the food products would be tumbled in the breading in a manner that is not unlike that which would be encountered in a manual breading operation, in which pieces of the food product would be individually handled. After a sufficient contacting time, the rotation would be stopped, the device opened and the contents removed, inspected if necessary, and passed on to further processing. A desirable appearance and texture, termed a "homestyle" coating, can be produced by drum type breading operations. Although producing a desired coating appearance and texture, particular problems encountered in a large scale tumbler unit are the size of the device and the number of pieces of the food product handled in a batch. As the size of the device becomes larger, the time required for loading and unloading becomes increasingly large, and this time is essentially dead time in terms of operation. Further, loading limitations are introduced because when a large number of pieces of food product are introduced into the device in a charge, the tumbling of the pieces against the other pieces may be detrimental to the breading process.

Other breading operations have been made continuous in the past. In such operations, the food products are typically placed on a conveyor belt and passed under a falling curtain of breading material. In many instances, such a falling curtain of breading cannot properly coat the entire food product in a single pass, and the pieces of food product must be turned or flipped, and breading reapplied to ensure an appropriate amount of breading coverage on the product. In some product configurations, a simple flipping of the product will not result in a proper coating. In addition, this type of breading operation simply can't achieve the "homestyle" coating appearance which is desired. Although deficient in these respects, the attractiveness of a continuous operation has resulted in commercial acceptance of these conveyor-belt based schemes to obtain high production rates and provide a cost effective breading operation.

An ideal breading operation would treat the food products as either individual pieces or as small groups of a few pieces, and would tumble these pieces in a sufficient amount of breading or coating material. The tumble time would be sufficient to entirely coat the pieces of food product. The process would optimally be continuous or any dead time associated with loading the pieces into the breading material, unloading the coated food products and recycling the unused breading material would be kept to an absolute minimum. A continuous operation would be supplied with food products to be coated on a continuous basis, preferably by a conveyor belt, and would discharge the coated product on a similar continuous basis, also preferably on a conveyor belt. In short, an ideal breading operation does not sacrifice the quality of coating for the sake of production speed, but instead provides a quality product in a timely and cost effective fashion.

SUMMARY OF THE INVENTION

Based upon the foregoing, there is a need to provide a coating device which can adequately handle various types of breading materials, particularly flour type breading and free flowing breading, wherein uniform and desired coating characteristics are achieved effectively and efficiently. It is of primary importance that the coating device be integrable into a continuous food processing operation. It is therefore a main object of the invention to provide a coating device